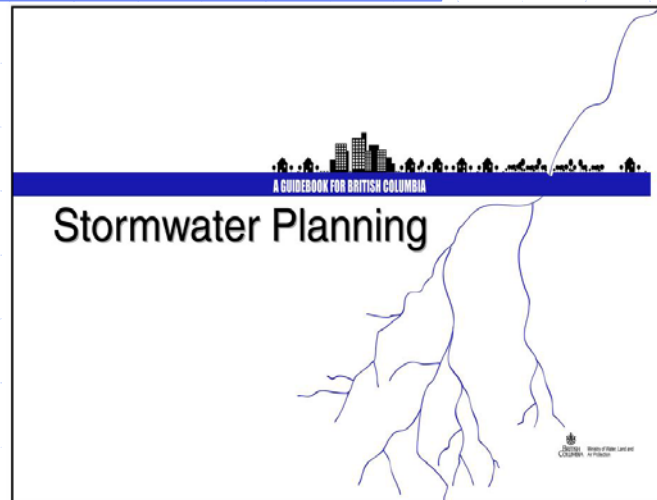


Beyond the Guidebook:

Making the connection between
Rainwater Management and Stream Health



Jim Dumont and Kim Stephens

April 2007

An aerial photograph of a residential development nestled within a dense forest. The houses are arranged in a winding pattern, with roads and green spaces interspersed among the trees. The overall scene illustrates the integration of land development with natural surroundings.

Guidebook Premise: Land Development and Watershed Protection can be Compatible

Policy Level Development Objectives

Science-Based Understanding
of Development Impacts

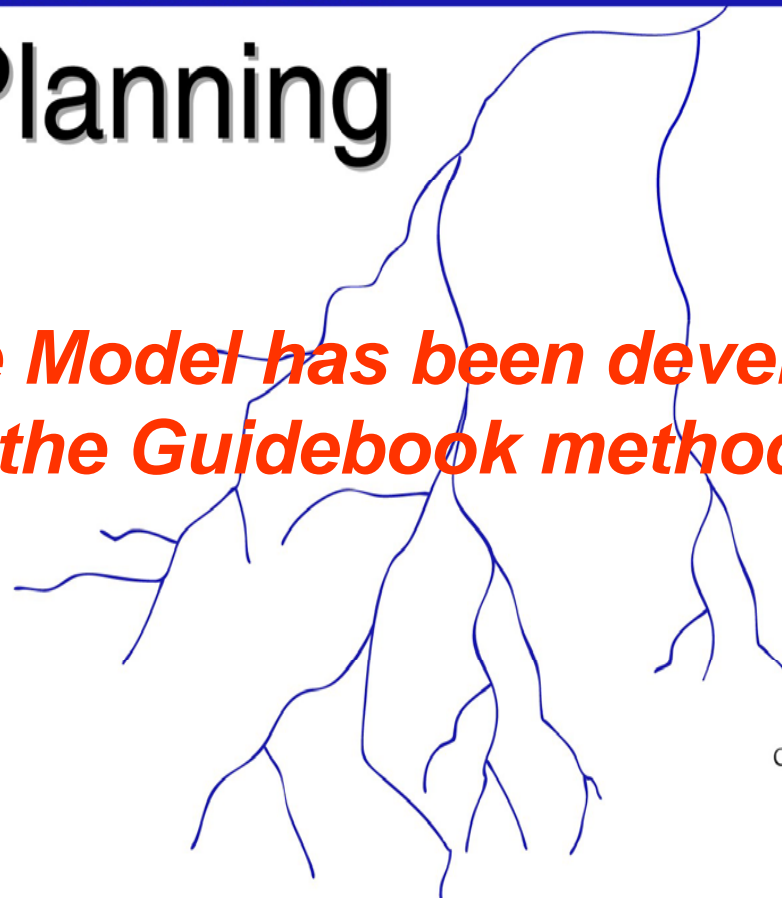
Site Design Practices that achieve Objectives



A GUIDEBOOK FOR BRITISH COLUMBIA

Stormwater Planning

The Water Balance Model has been developed as an extension of the Guidebook methodology

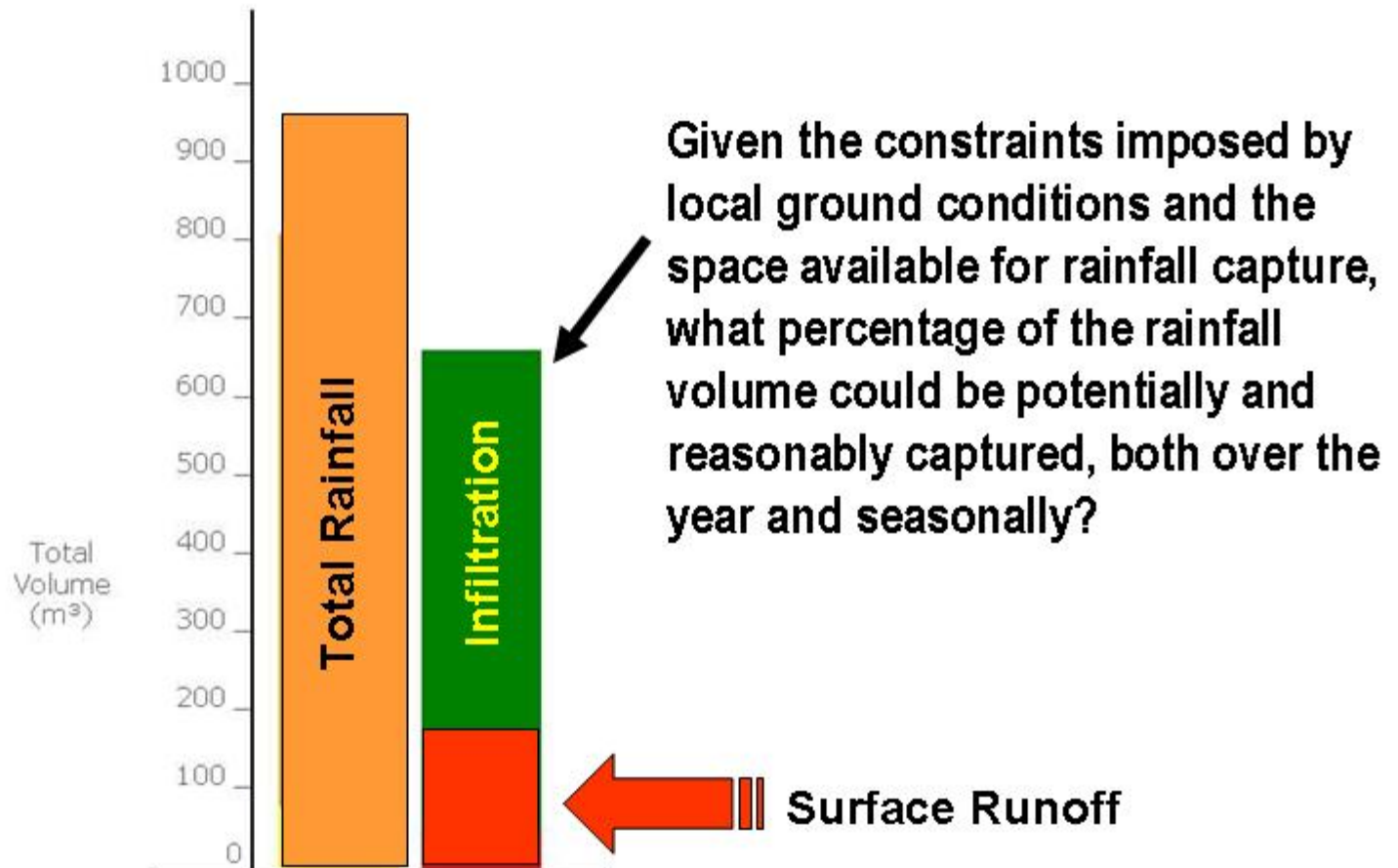




WATER Balance MODEL FOR BRITISH COLUMBIA

It enables users to test the achievability of Performance Targets

Water Balance Volumes For Catchment
Graph for the period Jan 1 1999 to Dec 31 1999



Coming this Fall: Water Balance Model powered by QUALHYMO

The screenshot shows a Microsoft Internet Explorer browser window displaying the website for the Water Balance Model in British Columbia. The browser's address bar shows "about:blank". The website features a navigation menu with "Home", "Site Information", and "Administrator Login". The main content area includes a map of British Columbia with regional abbreviations (YT, NT, NU, NL, BC, AB, SK, MB, QC, ON, NS, PE, NB, NS) and a prominent "Water Balance Model British Columbia" logo. Below the logo, it states "Powered By QUALHYMO" and provides navigation for "Water Balance Model", "Resources", and "Networking". A "New to the Model?" section explains the watershed-based approach and offers a "Free Trial Account" with a "Log In" button. A "Returning Users" section includes a login form with "Username" and "Password" fields and a "Log In" button. A "Become a Subscriber!" section encourages account creation with a "Create Your Account" button. A "Have you Received an Invitation?" section offers to "Join a Subscriber's Team". A "Finder" section shows a map of British Columbia with regions like Skeena, Okanogan/Peace, Southern Interior, Cariboo, Vancouver Island, Kootenay, and Lower Mainland. An "Events" section shows "Apr 2007". A "Beyond the Guidebook: Water Balance Model powered by QUALHYMO" section provides detailed information about the model's integration with QUALHYMO and its use for environmental assessment, with a "Read More" link. A "Suggest an Article" section invites users to contribute to the online community.

about:blank - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media

Address about:blank

Home Site Information Administrator Login

Water Balance Model

British Columbia

Powered By **QUALHYMO**

Water Balance Model Resources Networking

New to the Model?

The Water Balance Model promotes a watershed-based approach that manages the natural environment and the built environment as integrated components of the same watershed.

If you would like to try the Model, we suggest registering a Free Trial Account to start. When you are satisfied that it will meet your needs, upgrade by Subscribing at any time.

[*Register My Free Trial Account!](#)

Finder

By Region

Skeena Okanogan/Peace Southern Interior Cariboo Vancouver Island Kootenay Lower Mainland

Events

Apr 2007

Beyond the Guidebook: Water Balance Model powered by QUALHYMO

The Water Balance Model for Canada is being integrated with QUALHYMO in order to provide practitioners with a 'runoff-based tool' for source control evaluation and stream health assessment. The 'runoff-based approach' holds the key to assessing environmental impacts in watercourses and the effectiveness of mitigation techniques. The rollout of the integrated tool will commence at the Water Balance Model Partners Forum on March 30, 2006. A six-month beta testing period will follow. September 30th is the target date for the "Water Balance Model powered by QUALHYMO" being fully functional and available online to all users at <http://www.waterbalance.ca/>.

[\[Read More\]](#)

Returning Users

Username

Password

[Log In](#)

Become a Subscriber!

Tried the Model? Like what you see? The it's time to create an account!

[Create Your Account](#)

Have you Received an Invitation?

[Join a Subscriber's Team](#)

Suggest an Article

Suggest an article for this site. The success of this online community depends on suggestions from people like you!

Done Internet

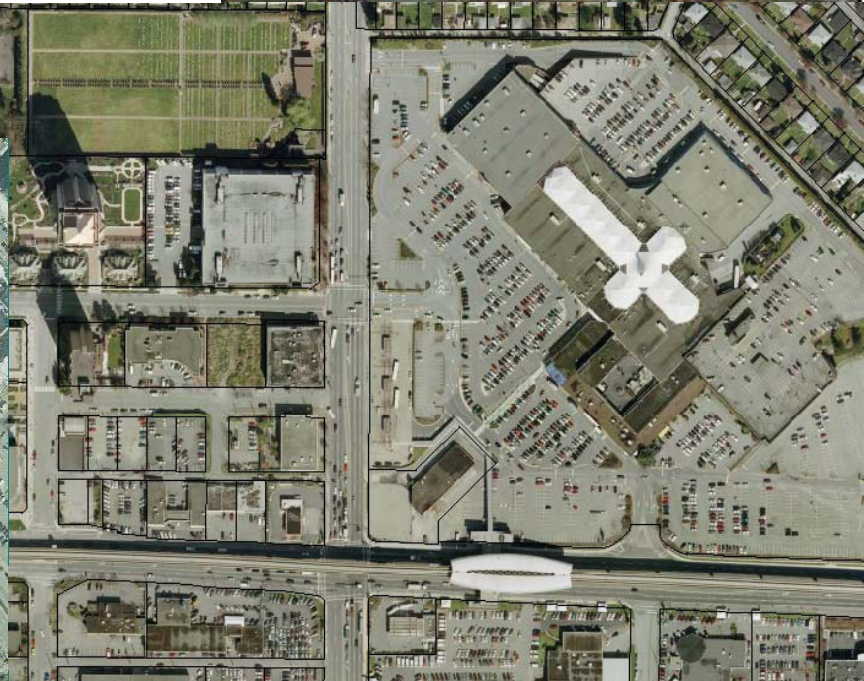
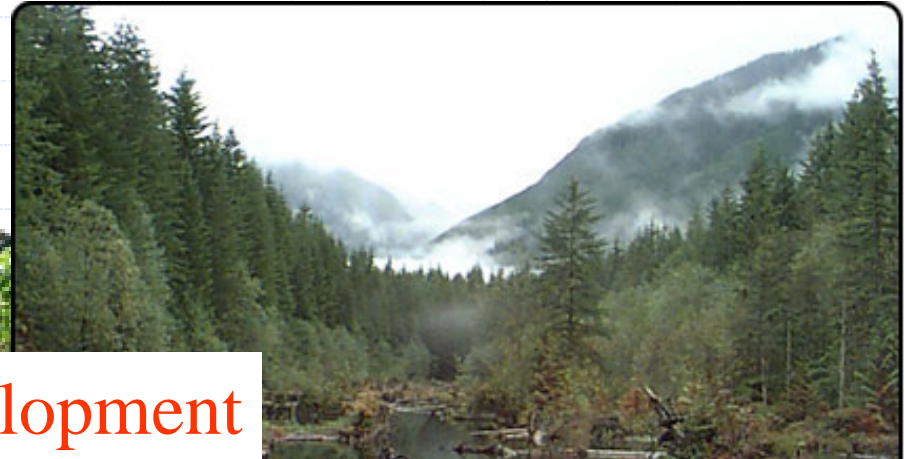


Beyond the Guidebook: Where Science Meets Analysis

Integration of the **Water Balance Model** and **QUALHYMO** means engineers will now have a runoff-based tool for source control evaluation and stream health assessment

The Goal

No impact results from development



DFO Guideline

- ◆ “Runoff will be modelled using continuous simulation”
- ◆ “Single event models are acceptable for preliminary sizing of BMP’s and conveyance systems if multiple event scenarios are modelled”

To Date

- ◆ Focus on rainfall
- ◆ Many documented issues with these methodologies
- ◆ Opportunity to follow DFO guidance
- ◆ "Go Beyond the Guidebook"

Runoff Basis

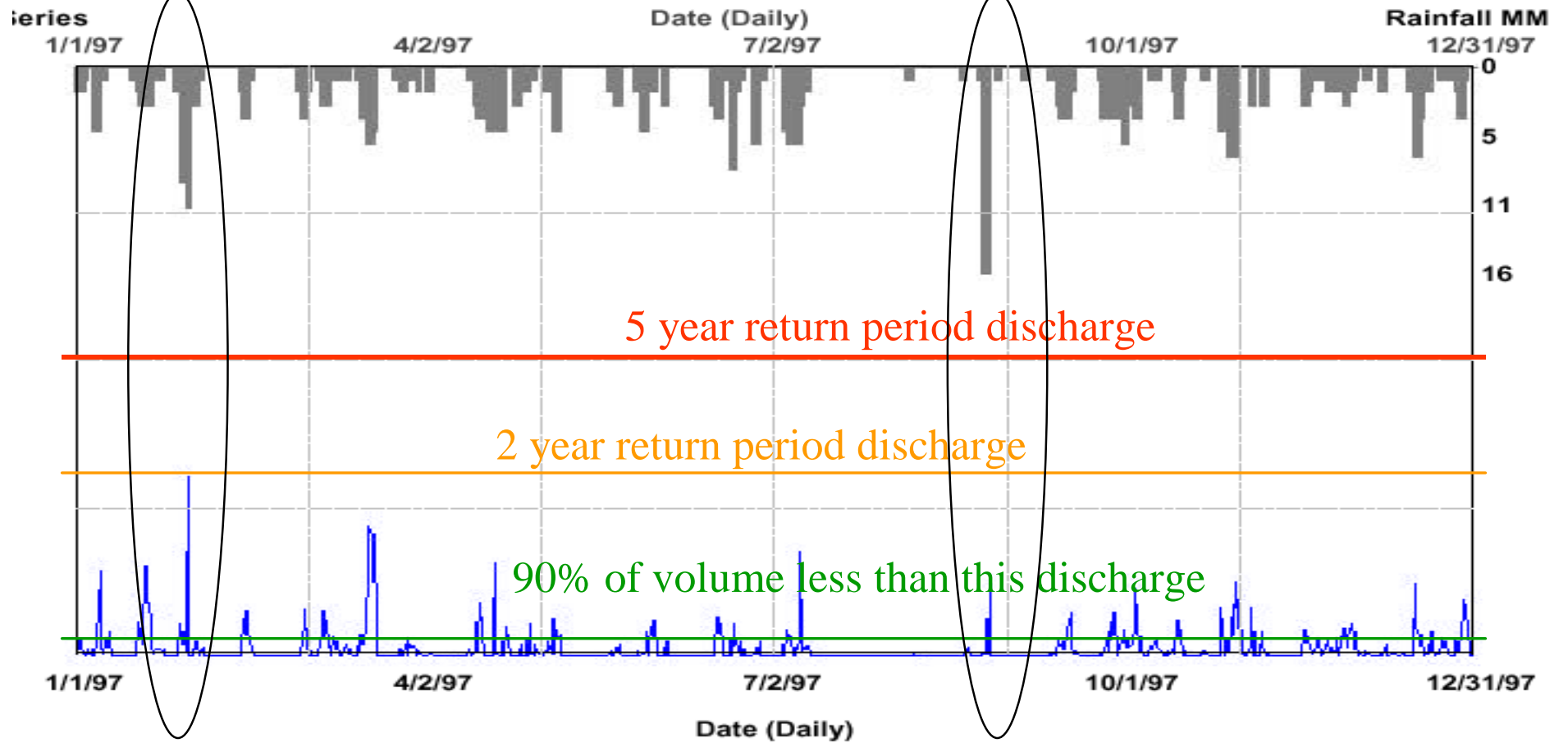
- ◆ Flow duration for habitat availability
- ◆ Tractive force to measure erosion
- ◆ Sediment washoff for water quality
- ◆ Optimize systems to manage the impacts of the altered hydrologic cycle

Modelling Approach

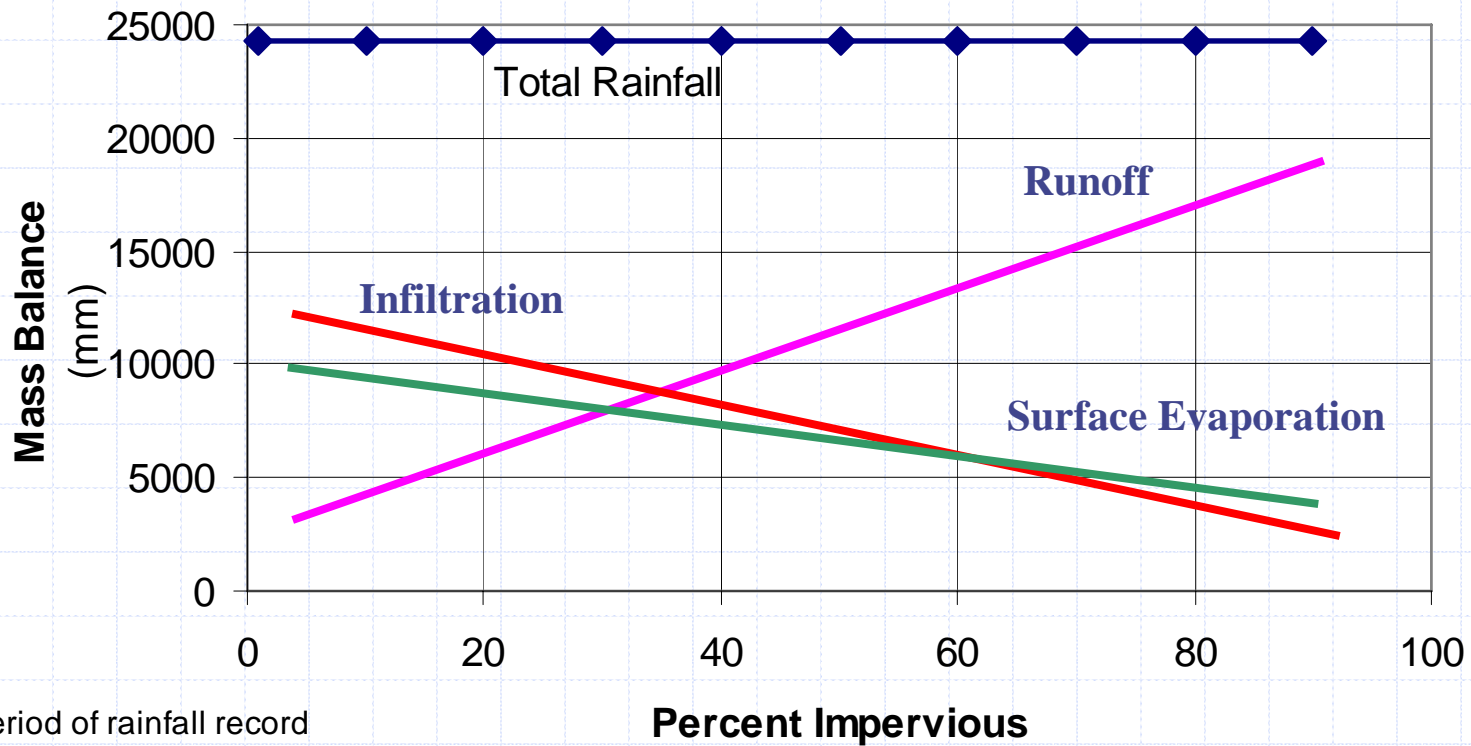
- ◆ Continuous simulation – Runoff Basis
- ◆ **Test** mitigation works **prior** to construction
- ◆ Can be used to assess stream impacts

Typical Year

Compare these two storm events



Hydrologic Change



Period of rainfall record
1982 through 1999

Duration of Discharge

- ◆ Critical to aquatic health
 - Durations are linked to stream health
- ◆ It can be measured and verified
- ◆ Computer simulations for duration of:
 - Flood discharges
 - Base flows
 - Fish habitat availability (depth vs duration)

Beyond the Guidebook

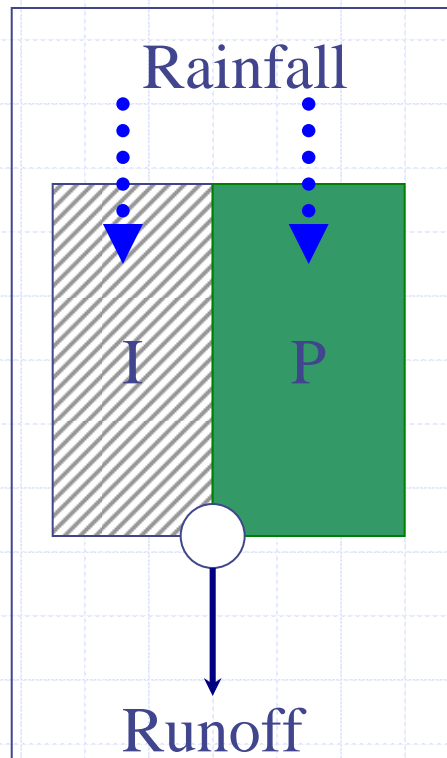
- ◆ Where science meets analysis
- ◆ Where the WBM is going
 - Providing the new evaluation tools
- ◆ Evaluate
 - Site
 - Watershed
 - Stream

Surface Change BMP

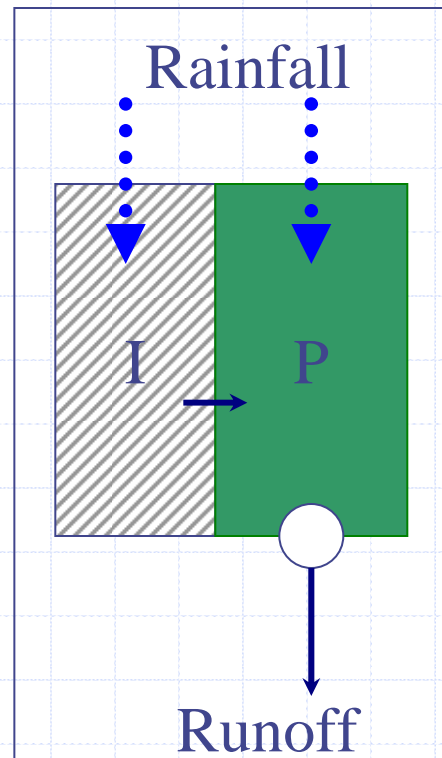
◆ Absorbent Landscapes

- Tree cover density
- Increased top soil depth
- Porous pavement
- Green Roof – Typical
- Some infiltration swales – without storage

Model Surface Changes



Typical Model



Some Models

Surface Alterations can reduce runoff volumes.
Change:

- Imperviousness
- Surface roughness
- Infiltration rates
- Soil moisture reservoir

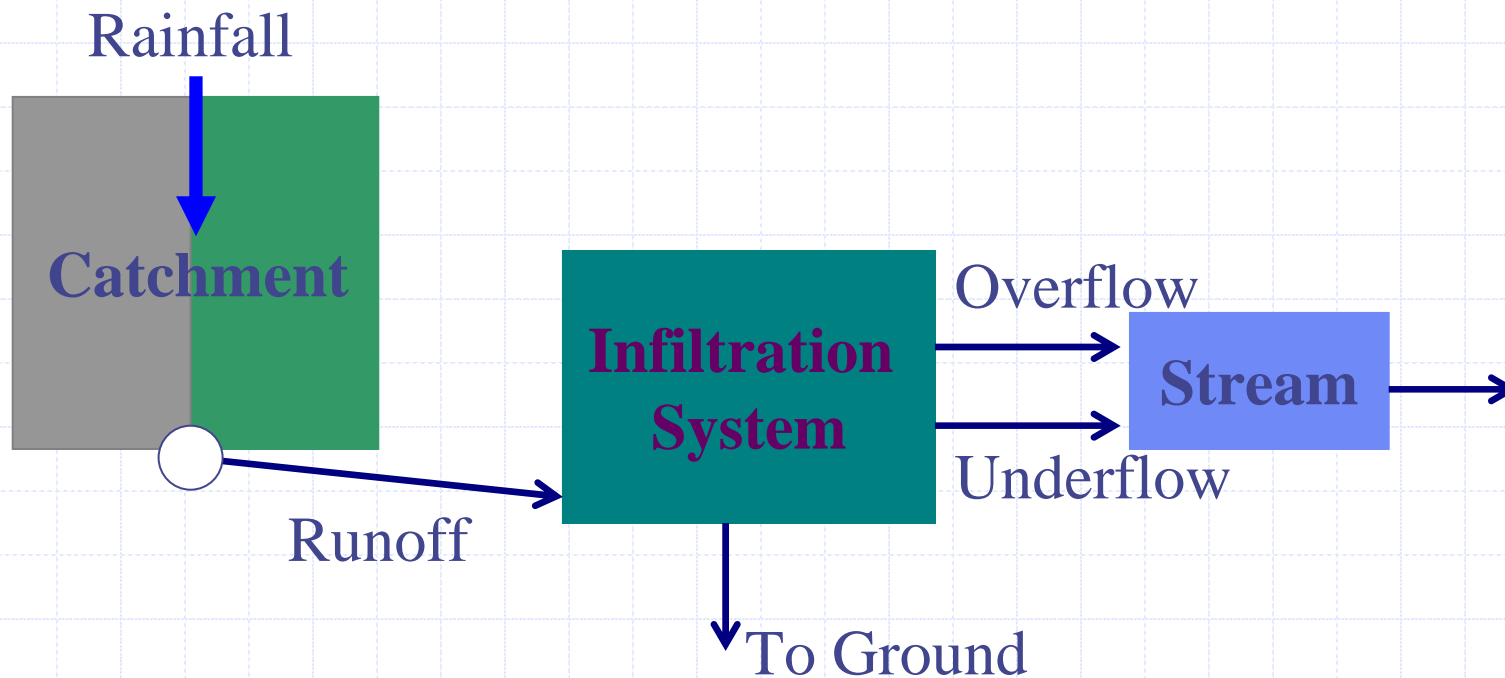
Existing WBM

Infiltration System BMP

- ◆ Capture surface runoff and STORE it
- ◆ Infiltration for volume reduction
 - Rain gardens
 - Infiltration swales with storage
 - ◆ Surface or subsurface storage
 - Infiltration ponds
 - Underground galleries

Infiltration Systems

- ◆ Happens after runoff occurs
- ◆ New WBM



Analysis Results

- Beyond the Guidebook

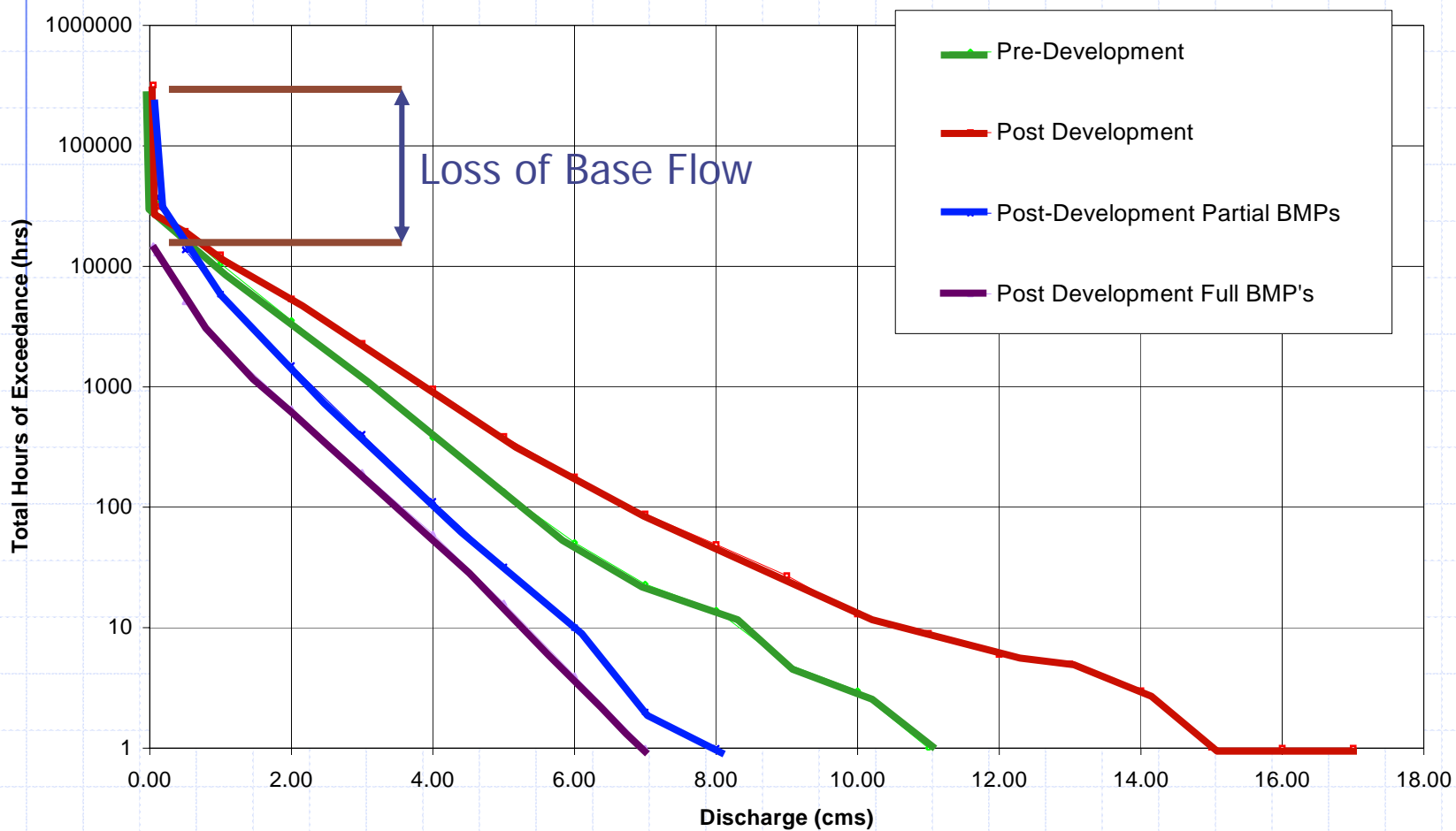
- ◆ Hydrologic Changes

- ◆ Flow Exceedance / Duration

- ◆ Potential Stream Erosion

- ◆ Stream Water Quality

Exceedance - Fergus Creek

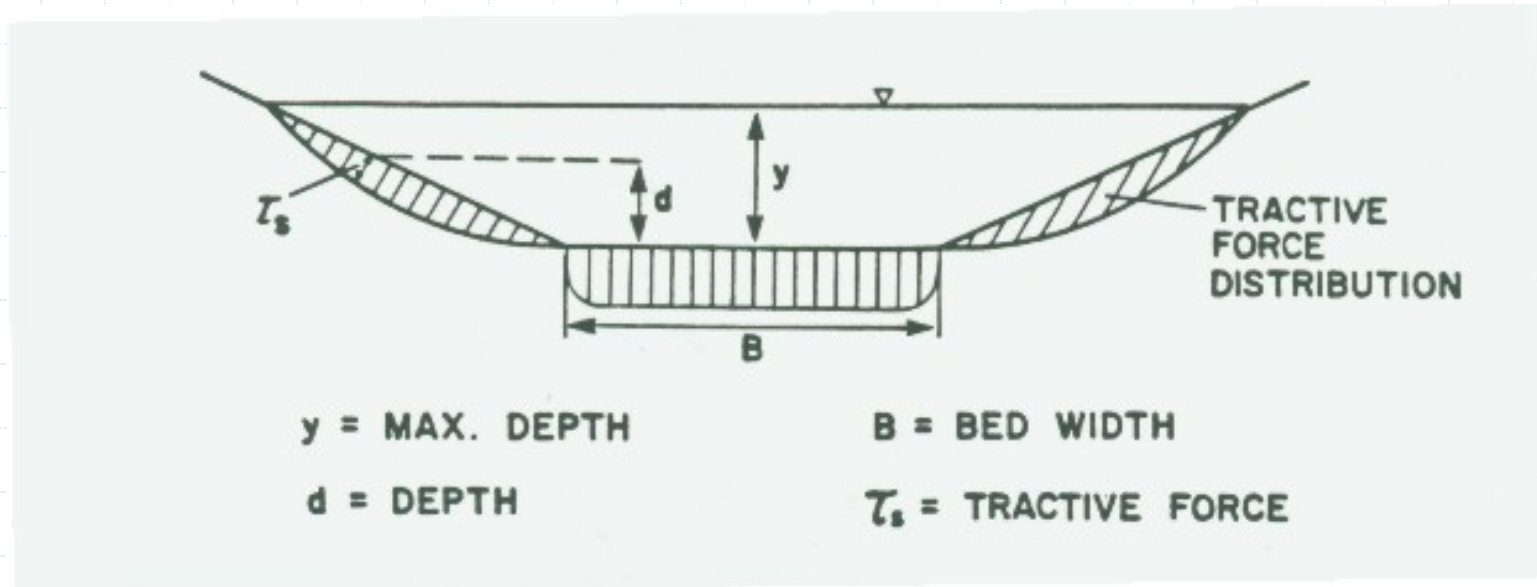


Stream Erosion

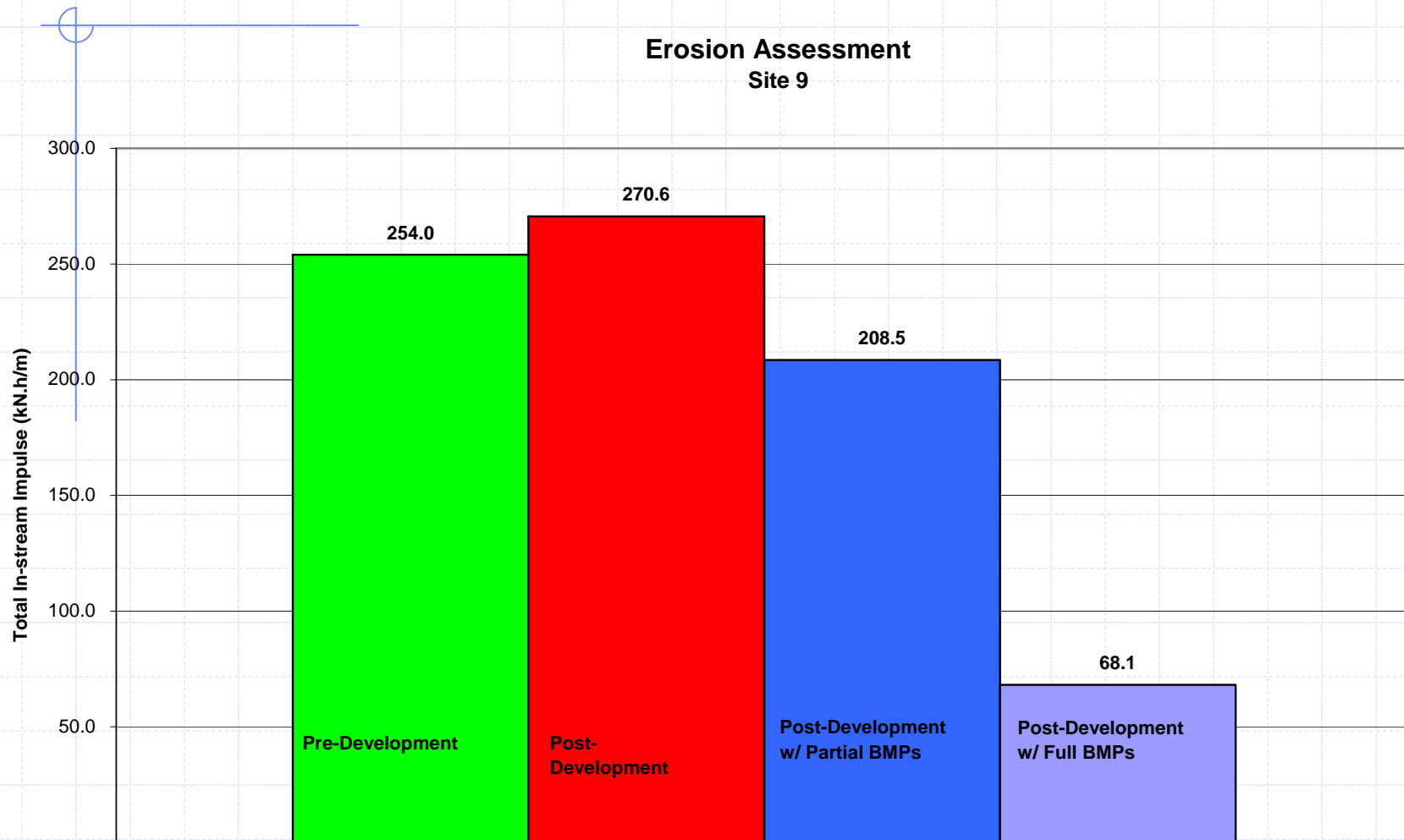


Tractive Force

Based upon Tractive Force calculations



Stream Erosion – Fergus Creek



Water Quality

- ◆ No consistent answer
- ◆ No consistent expectations
- ◆ Regulations vary greatly
- ◆ Suggest sediment and first order decay as surrogate measure

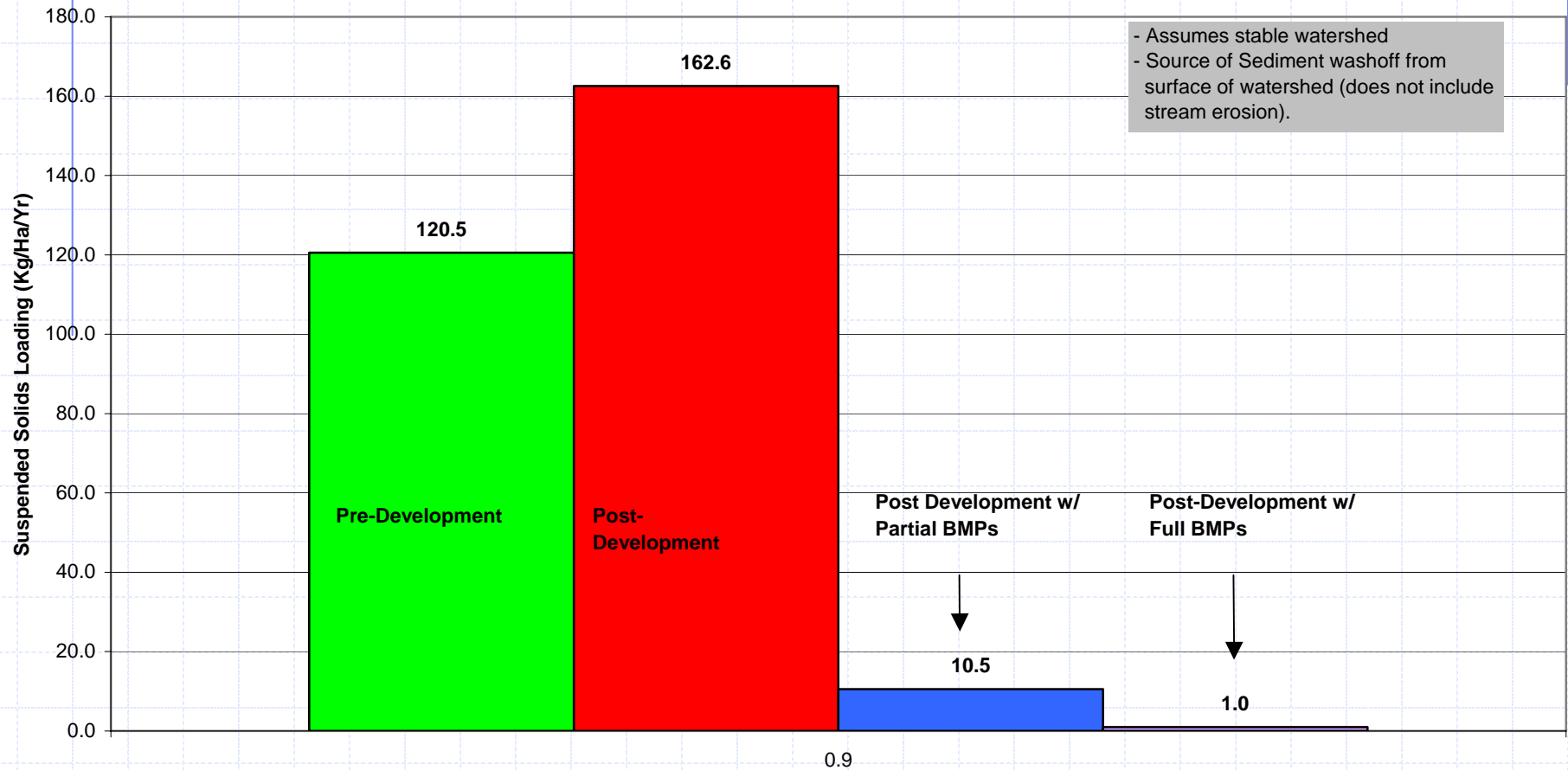
Sediment Supply

Sediment Supply

Type of Land Use	Sediment Yield (tonnes/ha/yr)
Natural Forest	0.66
Agricultural	0.11 to 2.2
Urban Construction	1.8 - 73.5
Stable Watershed	0.039 to 0.367
Urban Areas	0.10 to 0.61

Water Quality – Fergus Creek

Sediment Loadings Reach 4



Infiltration Systems

◆ RUNOFF Volume Reduction

- Not rainfall reduction systems

◆ Many alternatives

◆ Need Assessment and Design tools

◆ WBM will provide the tools

For more information about the *Water Balance Model powered by QUALHYMO*, just go to www.waterbucket.ca and the Rainwater Management Community-of-Interest

Home | Partners | Contact Us | About This Site

Visit these Communities of Interest

- Water Centric Planning
- Water Use and Conservation
- Rainwater Management
- Green Infrastructure
- Agriculture and Water
- Convening for Action
- Water Sustainability Committee

Latest Updates

- Irrigation Scheduling Calculator**
Read more at Agriculture and Water
- Water Balance Model**
Read more at Agriculture and Water
- POLIS Project report goes beyond the urban environment, addressing specific issues of governance**
Read more at Convening for Action
- WATER SUSTAINABILITY ACTION PLAN FOR BRITISH COLUMBIA**
Read more at Convening for Action
- Lantzville introduces low-impact development bylaw**
Read more at Green Infrastructure
- BRITISH COLUMBIA MUNICIPALITIES LEAD THE WAY WITH ECO-SENSITIVE STREETS:**

waterbucket
Sustainable Approaches to Water Resources

The vision of waterbucket.ca is to provide a resource-rich, highly interactive 'destination location' for timely and provocative information about water sustainability in British Columbia.